

A Review of
Passage of Juvenile and Adult Salmonids at Columbia and Snake River Dams.
JohnW.Ferguson, et al. 2003

General Comments:

The Ferguson et al., 2003, report provides a narrative on juvenile and adult salmonid passage through the hydrosystem and the possible factors that may influence their success. However, the report may be more appropriately titled, "Passage of juvenile and adult salmonids through the FCRPS dams of the Columbia and Snake rivers." The Mid-Columbia is referenced only in passing, in the section on surface bypass systems. Otherwise, information on smolt and adult survivals and travel times in the Mid-Columbia are largely missing.

The Introduction of this report states, "This report summarizes the information pertinent to the FCRPS as it is *currently* configured for each route of passage and life history, and discusses uncertainties associated with the existing database." This statement is not entirely correct. As evident by citations and references to outdated project configurations, much of the report was written circa 1999-2000. However, there are exceptions in which recent work has been referenced, particularly in Sections on Spill Survival (pp. 12-14), Effects of Bypass Systems on Smolt Condition (pp. 64-66), Surface Bypass Designations (pp. 79-80), Recent Estimates of Survival Through Turbines (pp. 88-90), Operation of Existing Turbines (90-92), Department of Energy Advanced Hydropower Turbine System Program (pp. 96-97), Water Temperature (pp. 113-114), and Kelts (pp. 117-120).

The result, unfortunately, is a mosaic; a report of outdated and updated sections intermixed. It is difficult to see how managers can use such information. If the report was consistently written as of the year 2000, it could be used to characterize the pre-2000 passage conditions of the hydro projects for eventual comparison with conditions during the schedule "check-ins" of 2005, 2008, and finally, 2010. If updated to 2003, it could represent current conditions. But as written, it misleads the reader as to the current state of the system.

The report is useful for obtaining a general overview of river and passage conditions that have transpired over the 1980s-1990s. It is not, however, a good reference source for specific information on status and trends of fish stocks and their interactions with the hydrosystem. It does not represent NOAA Fisheries's independent and substantial experience in interpretation of the existing Coded Wire Tag (CWT) or PIT-tag data. Of considerable disappointment, the report neither uses nor references the years of adult radiotelemetry studies sponsored by the US Army Corps of Engineers (USACE) and performed by the University of Idaho.

A combination of externally driven urgency and delayed reporting from the investigations just mentioned, may partly absolve NOAA Fisheries for this omission.

However, investigations from entities with a reputation for generally prompt follow up documentation are also absent, for instance, the USACE-sponsored and US Geological Survey-conducted smolt radiotelemetry studies in the lower Columbia. Additionally, discussion and summary of the smolt transportation program as part of juvenile passage is entirely absent from this report, as is any discussion of the efficacy of summer spill. Both of these topics should have been addressed and its difficult to understand their complete absence from a document submitted to a collaborative process.

The dated nature and significant omissions in the report preclude its effective use in assessing the status of recovery, determining compliance with the reasonable and prudent alternative of NOAA's 2000 Biological Opinion on the operation of the Federal Columbia River Power System, or determining past or current status of juvenile or adult salmonid performance standards. Consequently, in its current form, the report cannot be used by managers as a thorough summary of the status of research and development of the fish passage systems.

We strongly encourage NOAA, to augment the final paper with a much greater numbers of tables and figures summarizing existing information (examples, Tables 1 and 2) from as many recently available investigations as possible. Summaries, providing guidance on the best available information for both past and current hydro operations, and a characterization of the types of operations and project configurations NOAAF may place greater or lesser confidence in, along with their rationale for doing so, would also be welcome.

As is, the report reads as a narrative of selected information, with no guidance as to why some information was used and other information was not. The result does very little to clear up apparent inconsistencies, sometimes even conflicts, between existing data sets, nor does it shed much light on differing interpretations of the more consistent available information. This makes it challenging for the Action Agencies to develop proposed operations in line with NOAAF expectations. We anticipate that there will be opportunity to rectify this disconnect in the next few weeks. Reconciling different interpretations of available scientific information has become the foundation of consultative discussions in the past several years.

Specific Comments:

Page 1, Introduction: The title, "Passage of juvenile and adult salmonids at Columbia and Snake river dams," seems to suggest all hydroprojects, but the report seems to ignore the Mid-Columbia projects. The title should be changed to reflect only the FCRPS (Federal Columbia River Power System).

Pages 6-8, Spillway Efficiency and Effectiveness: The majority of references to spillway efficiency and effectiveness dated to the 1990s. The vast amount of work, both hydroacoustic and radiotelemetry, in the lower Columbia is absent from the discussion. This section needs to be updated. The Hansel and Beeman (1999) reference fails to mention which project it refers to.

Page 9, Seasonal Spillway Timing: "Under late-summer, low flow conditions, it takes subyearling chinook salmon approximately 3 weeks to travel from lower Granite Dam to Bonneville Dam." There is no mention of travel time under normal or high flows for

comparison, nor is there discussion of the relevance of this point or of the magnitude of the ‘problem’ of inriver fish receiving no benefit from spill after August 31.

Page 11, Tailrace Passage: Regarding tailrace passage and providing spill for both adult and juvenile salmonids, no reference is made to any of the adult radiotelemetry work conducted by the University of Idaho.

Pages 12-14, Spill Survival: This section refers to “relative survival,” in several places, although we suspect the values being quoted are estimates of absolute survival. The terminology is unnecessarily confusing.

The distinction between Table 1 and Table 2 spillway survivals is not clear, and the summaries should be combined. Standard errors for the survival estimates in Table 2 should be provided. The accompanying discussion does little to distinguish between apparent significantly different data sets, both in quantity and quality, and analytical techniques. That may be why it seems unnecessarily dated even though it includes brief references to 2003 citations.

Pages 22: In discussing TDG work, the CRiSP model is calibrated with monitoring data and it accurately predicts the levels of gas through the seasons. Also, real-time gas monitoring can give a fairly accurate projection of seasonal gas levels dependent on flow and spill projections. The source for these estimates is http://www.cbr.washington.edu/crisprt/index_snake_col_wq.html.

Pages 27-33, Fish Guidance Efficiency: On page 28, the report states, “Fyke-nets are most commonly used to sample unguided juvenile salmonids.” The use of fyke-nets was the most common approach to estimating fish guidance efficiency (FGE) in the 1980s and early 1990s. Since then, radiotelemetry and hydroacoustics have been the methods of choice to minimize mortality of listed salmonids. This report includes no FGE results after 1999 and needs to be updated.

Table 5. the range of hydroacoustic FGE values likely is based on hourly values that are statistically very noisy. Most of the hydroacoustic studies were designed to provide precise seasonal estimates, not hourly values. Season-wide estimates and associated standard errors are more appropriate and meaningful. The same also applies to the fyke-net and radiotelemetry results.

Pages 45-62, Diel Passage and Timing: Throughout this section it must be recalled that observed diel passage distributions at powerhouses and spillbays may be confounded with dam and spill operations. Any interpretation of tagging or hydroacoustic data must take dam operations into consideration. Extracting diel patterns from reports without the accompanying dam and spill patterns may be adding more confusion than insight. Along this line, we suggest the last sentence on page 53 be deleted, lest someone get the impression that fish actually could pass through spillways during no daytime spill.

In addition, PIT-tags can provide information on diel arrivals to the powerhouse (i.e., bypass system) at such sites as McNary (p. 51) where other information is not available (see Figure 1 below). The report ignores all of the available PIT-tag information in this discussion on diel passage.

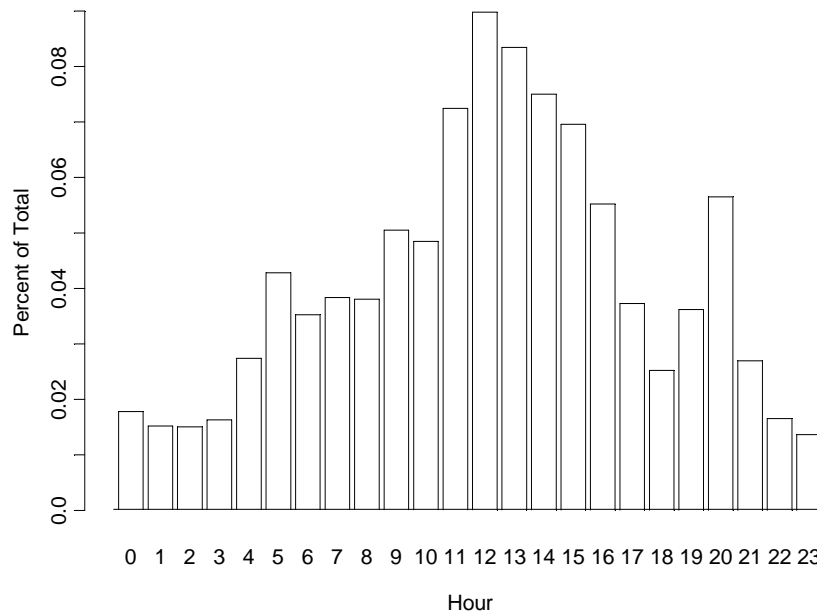


Figure 1. Diel arrival distributions at McNary Dam based on 2003 wild yearling chinook salmon PIT-tag detections.

Page 62-64, Water Temperature Effects: The report states a Water Quality Team was established to develop a plan to control water temperatures in the Columbia by 2000. The results are not stated, nor is there any reference to other water quality factors that could be affecting migrating salmonids, although both the sources and the potential for harm are likely similar. Nor is there any evaluation of operational modifications in recent years to address water quality problems.

The report seems to infer that smolt mortalities in the juvenile fish facilities mirror mortalities expected inriver without data to support such a contention. It would be helpful to have graphs plotting frequency of mortality versus water temperature to better understand the significance of the problem during July and August months.

Pages 76-87, Juvenile Passage through Surface Bypass Systems and Sluiceways:

This section of the report was clearly written about 1999-2000. References to work to be performed in 2000 (p. 81), 2001 (pp. 81, 85, 86), or 2002 (p. 85) date this material. Some updating of work performed at Lower Granite Dam, pp. 79-81, since 2000 has been included in this section, but other updates are either missing or only superficially discussed. The section omits recent bypass work at Bonneville and Rocky Reach dams and all survival studies through surface bypass systems to date. For ESA purposes, and in light of the amount of attention these facilities have received in recent years, a more comprehensive approach is desirable.

Page 77. The report should mention the Goodwin-Nestler work on fish passage modeling. Several papers are published and others are in review.

Pages 88-89, Recent Estimates of Survival Through Turbines: This section reports on research since 2000 and into 2003. The point estimates referred to as “relative survival”

are in actuality estimates of absolute survival through turbines. Such wording is misleading.

Pages 90-92, Operation of Existing Turbines: This section is current on existing research.

Pages 93-97, Minimum Gap Runners/DOE Advanced Hydropower Turbine System Program: This section is current on existing research.

Page 98: Conclusions for ACOE's Turbine Passage Survival Program. This type of conclusion section should appear for all major topics in the report, or, at the very least, an explanation as to why such a conclusion is not possible, and suggested directions toward resolution, as is done in the last paragraph of this section.

Pages 99-102: We question whether this section would not better fit in the Williams et al. 2003 paper, and, in fact, if it should remain a discrete section in any paper. It is a rather odd collection of items to receive the rather important title of 'Key Uncertainties.' The consistency with which performance measures are applied is not so much an uncertainty, as seems to be implied by one subsection, as it is an error; and the nature and target of evolutionarily selective forces, seems more a theoretical discussion than one of unresolved uncertainty, at least for practical purposes. The Extra Mortality topic is, in fact, treated in some detail in the Williams et al. 2003 paper, and risks some confusion between the separate characterizations, both in their terminology as well as the interpretations represented in each. It could be deleted here to avoid any potential difference between the two reports, and because of the unknown nature of the relationship between hydrosystem passage and EM.

Page 101: Lamprey are treated, but information for sockeye seems to be lacking in this report. At the least, updated Fish Guidance Efficiencies (FGE) estimates for that species of salmon in the lower Columbia ought to be possible, or an explanation of how and when the issue of sockeye passage through the hydrosystem will be addressed seems appropriate.

Pages 103-120, Adult Passage: This section was based in part on the synthesis developed by Bjornn and Peery (1992) with supplemental information since then. Most of the references are on or before 2000 with the exception of the section on "kelts." Information as recent as 2003 was used in the review of kelt passage and survival estimation. Again, it is surprising that more references to adult radiotagging conducted by the University of Idaho since 2000 are not in the report. Certainly, much of that absence may be due to report preparation, editing, and an apparently lengthy review cycle experienced by the University of Idaho in publishing and reporting the USACE-funded studies. Nevertheless, it is difficult to believe the report represents the current status of adult passage without more of that information.

Page 110: Adult survival – this is a good example of where a table of estimates would be most instructive.

Page 111: The last sentence of the first paragraph indicated PIT-based survival estimates are accurate. However, this is true only if tributary turnoff, mainstem spawning, fishery removals, etc., can be independently estimated. That is a difficult proposition without accompanying telemetry studies. The RME group delved into this difficult problem.

Page 120: Another example of a place where a summary of key findings and conclusions for adult is warranted.

Page 123: Sturgeon are listed in the last subheading on this page, but not treated in the paper.

Page 124: Under the subheadings of Inter-Dam Losses and Adult Count Accuracy, we once again suggest the point be made that PIT tagged adult detection helps improve our ability to estimate both adult numbers and their ultimate fates, at this time, the improvement is only possible in concert with radiotelemetry.